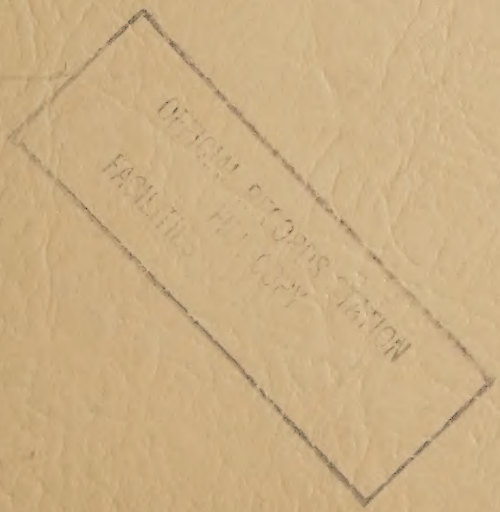
OPERATING INSTRUCTIONS

RETURN TO

TEST EQUIPMENT STORE
COPY NO.

TYPES 1209-C AND -CL

UNIT OSCILLATORS



GENERAL RADIO COMPANY

N

OPERATING INSTRUCTIONS

TYPES 1209-C AND -CL

UNIT OSCILLATORS

Form 1209-0100-N
November, 1964

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

TABLE OF CONTENTS

Section 1. INTRODUCTION 1

1.1 Purpose 1
1.2 Description 1
1.3 Amplitude Modulation 3
1.4 Sweep Operation 4
1.5 Auxiliary Equipment 5

Section 2. OPERATING PROCEDURE 9

2.1 Installation. 9
2.2 Operation 10

Section 3. APPLICATIONS 11

3.1 General 11
3.2 Unit Oscillator as Signal Generator for Receiver Testing 11
3.3 Unit Oscillator as a Television Signal Generator. . . 12
3.4 Unit Oscillator as a Frequency Converter. 13

Section 4. SERVICE AND MAINTENANCE 14

4.1 General 14
4.2 Tube Replacement 15
4.3 Frequency Calibration 15
4.4 Lubrication 16

SPECIFICATIONS

Frequency Range: Type 1209-CL, 180 to 600 Mc; Type 1209-C, 250 to 960 Mc.

Tuned Circuit: Butterfly, with no sliding contacts.

Frequency Calibration Accuracy: ±1%.

Warmup Frequency Drift (typical): 0.2% (see Figure 1-5).

Frequency Control: A six-inch dial with calibration over 330°, with a slow-motion drive of about 14 turns.

Output Power into 50 Ohms:

Oscillator	Power Supply	Frequency (Mc)	Power (mw)
Type 1209-CL	Type 1267-A or 1201-C or 1264-A	180 - 500	270
		500 - 600	200
Type 1209-CL	Type 1269-A or 1203-B	180 - 500	320
		500 - 600	240
Type 1209-C	Type 1267-A or 1201-C or 1264-A	250 - 960	120
Type 1209-C	Type 1269-A	250 - 960	150

Output System: A coupling loop at the rear of the instrument feeds a Type 874 locking coaxial connector through a short rigid coaxial line. The coupling loop can be adjusted over a wide range to control power output, and can be clamped in any position.

Modulation: An external audio-frequency plate modulator can be connected to the front panel MODulation jack. The modulation impedance is approximately 8000 ohms. A sine wave of 40 volts rms will produce approximately 30% a-m. For 400- or 1000-cycle modulation, the Type 1214-A Unit Oscillator is recommended. The Type 1263-B Amplitude-Regulating Power Supply can be used for 1-kc square-wave modulation, the Type 1264-A Modulating Power Supply for square-wave or pulse modulation For minimum incidental fm, the Type 1000-P6 Crystal Diode Modulator of the Type 1000-P7 Balanced Modulator can be connected between the rf output connector and the load.

Power Supply: Six types of power supply are recommended; the choice depends on the intended application. Refer to the table of accessories, paragraph 1.5.

Tube: One type 6481.

Mounting: L-bracket with 7-inch-high panel for rigid attachment to companion power supply and easy relay-rack mounting.

Accessories Supplied: Type 874-R22LA Patch Cord, and a telephone plug.

Accessories Available: Refer to Table 1, paragraph 1.5.

Dimensions: Width 8, height 7 5/8, depth 9 1/2 inches (205 by 195 by 245 mm), over all.

Net Weight: 6 pounds (2.8 kg).

Patent No. 2,548,457

General Radio Experimenter references: Vol 37 No. 8 August 1963.

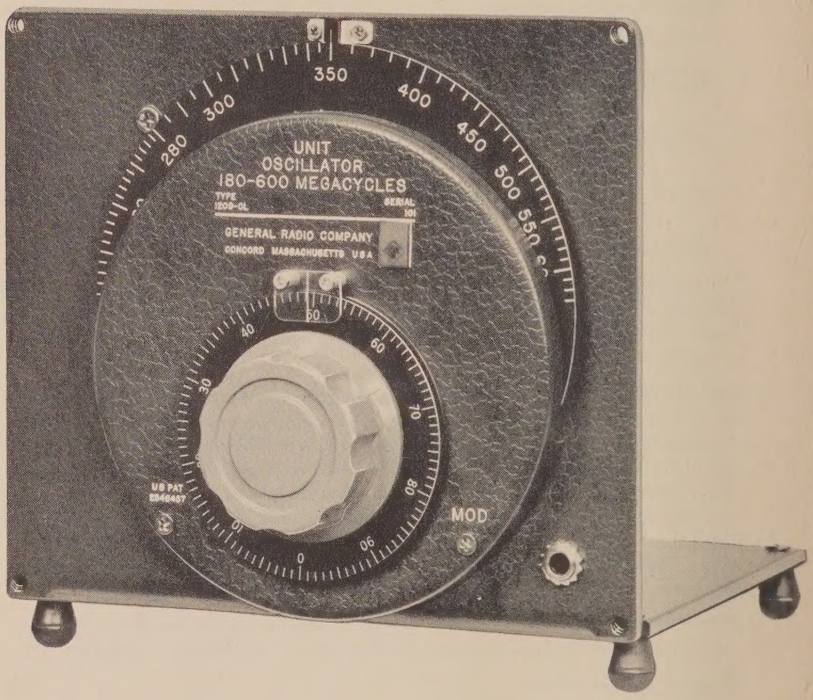


Figure 1-1. Panel View of the Type 1209-C Unit Oscillator (Type 1209-CL identical in appearance except for dial calibration.)

SECTION **1**

INTRODUCTION

1.1 PURPOSE.

The Types 1209-C and 1209-CL Unit Oscillators (Figure 1-1) are general-purpose radio-frequency power sources covering the ranges of 250 to 960 Mc and 180 to 600 Mc, respectively. These members of the convenient Unit Instrument line can be used to drive bridges, slotted lines, impedance comparators, and other measuring equipment. Used with a voltmeter and attenuator, they provide accurately known output voltages for the testing of receivers. Direct amplitude modulation is possible over the audio-frequency range, and amplitude modulation free from incidental fm can be obtained with a simple crystal-diode modulator from zero to 5 Mc. Connected to a mixer, the Unit Oscillator can be used as the local oscillator in a heterodyne receiver to convert the Type 1216-A Unit I-F Amplifier or a low-frequency communications receiver into a vhf or uhf detector. Pulsing and linear 100-percent amplitude modulation can be obtained with an external balanced modulator.

1.2 DESCRIPTION.

1.2.1 GENERAL. The tuning system of the Type 1209-C Unit Oscillator is a "butterfly" circuit, which combines a variable air capacitor and a variable inductor in a single unit with no sliding contacts. Inductance varies from 0.012 μh at the low-frequency end of the tuning range to 0.004 μh at the high-frequency end, and capacitance varies from 40 pf to 7 pf. The inductance of the Type 1209-CL Unit Oscillator is exactly twice as large. The vernier dial requires about 14 turns to rotate the main dial over its full 330 degrees. The rotor of the tuning unit is geared down for 80-degree rotation. The frequency calibration is accurate within 1 percent.

With the exception of frequency and output-characteristic differences stated in the specifications, the Types 1209-C and 1209-CL are identical, and all information in this manual applies to both.

Plate and grid of the oscillator tube are connected to the tuned circuit, and the cathode is left floating. The oscillator circuit is of the Colpitts type, with feedback determined essentially by the electrode capacitances of the tube. A small amount of cathode-plate capacitance has been added.

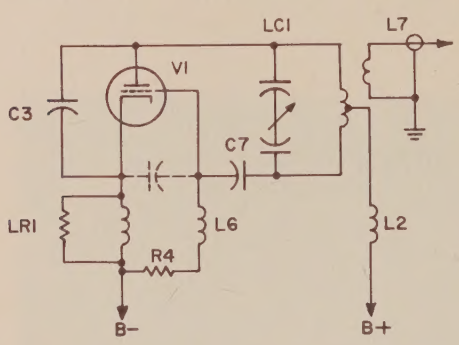
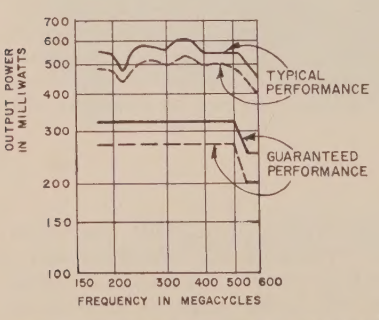


Figure 1-2 Elementary schematic diagram of the Type 1209 Unit Oscillators.

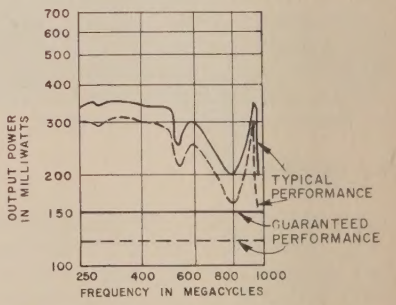
1.2.2 OUTPUT SYSTEM. The output system is a short coaxial line, with a coupling loop on one end and a Type 874 Coaxial Connector on the other. Coupling between the loop and the oscillator can be adjusted over a wide range, and the loop can be clamped in the desired position. Maximum power can be delivered to load impedances normally encountered in coaxial systems.

Power available into a 50-ohm load is plotted against frequency in Figure 1-3 for a Type 1209-CL, and in Figure 1-4 for a Type 1209-C Unit Oscillator.



— WITH TYPE 1269 (OR TYPE 1203) POWER SUPPLY
--- WITH TYPE 1267, 1201 OR 1264 POWER SUPPLY

Figure 1-3 Output power into a 50-ohm load for a typical Type 1209-CL.



— WITH TYPE 1269, (OR TYPE 1203) POWER SUPPLY
--- WITH TYPE 1267, 1201 OR 1264 POWER SUPPLY

Figure 1-4 Output power into a 50-ohm load for a typical Type 1209-C

1.2.3 FREQUENCY STABILITY. For many applications a well-regulated and filtered power supply should be used to avoid frequency variations caused by line-voltage fluctuation and to produce a clearer beat note at the highest frequencies. With an unregulated power supply and a Type 1209-C

Unit Oscillator, a line-voltage variation of 20 percent causes a frequency change of about 0.01 percent at frequencies up to 600 Mc, and a frequency change of about 0.05 percent at the top end of the frequency range.

The frequency of the oscillator varies for some time after the power has been applied, until the temperature has stabilized. This warmup drift is usually well under ±0.2%. It depends on frequency and varies considerably from one oscillator to another. A representative curve of warmup drift is shown in Figure 1-5.

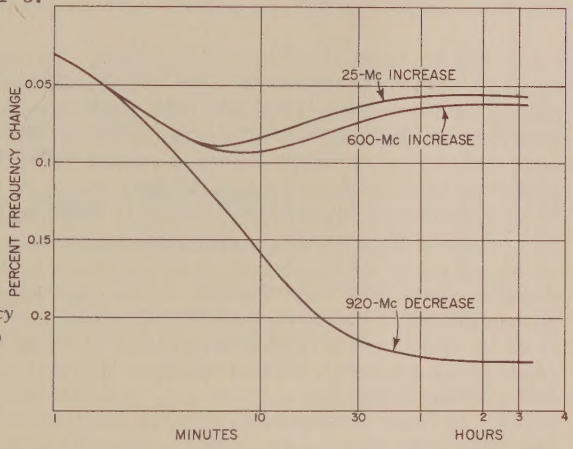


Figure 1-5 Warmup frequency drift for a typical Type 1209 Unit Oscillator.

1.2.4 POWER REQUIREMENTS. The Type 1209 Unit Oscillators require external power supplies. The choice among the six General Radio Power Supplies recommended in paragraph 1.5 should be based on the intended application of the oscillator. If a power supply other than one of those recommended is used, it should be capable of delivering 300 to 330 volts dc at 36 ma for the plate, and 6.3 volts at 0.4 ampere for the heater.

1.2.5 ACCESSORIES SUPPLIED. Supplied with the Unit Oscillator are a Type 874-R22LA three-foot coaxial double-shielded Patch Cord and a phone plug.

1.3 AMPLITUDE MODULATION.

1.3.1 GENERAL. Amplitude modulation permits increased detection sensitivity through the use of a tuned amplifier, such as the General Radio Type 1232-A, following the rf detector. Recommended modulators are described in paragraph 1.5.

1.3.2 SINUSOIDAL AMPLITUDE MODULATION. A jack on the front panel of the oscillator permits connection of a plate modulator, such as the Type 1214-A. For the Type 1209-C Unit Oscillator, incidental fm is about 0.01% for 50-percent amplitude modulation at carrier frequencies up to 400 Mc, and 0.1% at the high-frequency end of the tuning range. The modulator must supply a dc path and must be able to carry 36 milliamperes dc. A

sine wave of 40 volts rms amplitude will produce approximately 30% amplitude modulation.

1.3.3 SQUARE-WAVE AMPLITUDE MODULATION. One-hundred-percent square-wave amplitude modulation (oscillator either off or operating at a fixed level) is accompanied by considerably less fm than is sinusoidal amplitude modulation. When operated with a Type 1263-B Amplitude-Regulating Power Supply, the oscillators provide a leveled rf output of 20 milliwatts, cw or peak with 1-kc square-wave modulation, to a 50-ohm load.

1.3.4 PULSE AMPLITUDE MODULATION. To obtain high-level pulse and square-wave output from the Type 1209 oscillators, a modulating pulse or square wave of several hundred volts peak amplitude can be applied to the oscillator in place of the dc voltage required for cw operation, The peak amplitude of the rf output pulses of square waves depends both on the amplitude of the modulating signal applied and on its duty ratio because of the filter capacitors and voltage dividers in these oscillators.

With a Type 1264-A Modulating Power Supply, the peak amplitude of short pulses is approximately 3 db greater than the cw amplitude, and decreases as the duty ratio increases; the peak amplitude of square waves is approximately 1 db lower than the cw amplitude. At 500 Mc a typical rise time is 3 μsec and a typical decay time is 4 μsec. Some shortening of the input pulse occurs because of the delay in starting of the oscillator. At 500 Mc, a 10-μsec-wide input pulse may typically produce a 9-μsec-wide output pulse. At lower frequencies, greater starting delay and appreciable leading-edge jitter may occur. When better pulses are required, an absorption modulator should be used.

1.3.5 ABSORPTION AMPLITUDE MODULATION. Amplitude modulation free from incidental fm can be obtained by connection of a crystal-diode absorption modulator between the oscillator output and the equipment under test. With the Type 1000-P6 Crystal Diode Modulator, 30% amplitude modulation can be obtained with a peak output of 10 millivolts across 50 ohms. With the Type 1000-P7 Balanced Modulator, excellent pulse modulation with 60-db carrier suppression between pulses and 20-nanosecond rise time is possible. The peak rf output is 10 millivolts across 50 ohms.

1.4 SWEEP OPERATION.

The Type 1209 oscillators are well suited for swept operation due to the use of ball bearings in the tuning drive mechanism and to the absence of sliding contacts in the rf circuits.

A sweep drive can be coupled either to the slow-motion dial or to the main frequency dial of the Unit Oscillator. When the main frequency dial is coupled to the sweep drive, the sweep rate should be restricted to one excursion per second or less. The slow-motion dial can be driven at rates up to 5 cycles per second. The Type 1263-B Amplitude-Regulating

Power Supply will maintain a constant rf output amplitude as the oscillator is swept.

When the Unit Oscillator is driven by a sweep or dial drive, all moving parts in the oscillator must be lubricated in accordance with paragraph 4.4. For recommended dial drives, refer to paragraph 1.5.

1.5 AUXILIARY EQUIPMENT.

The Types 1209-C and 1209-CL Unit Osillators can be used in conjunction with a variety of auxiliary General Radio equipment to build a signal-source system which is suited to specific requirements. Typical systems are shown in Figure 1-6.

Table 1 lists the accessories recommended for use with the Type 1209 oscillators. The choice of a recommended power supply, modulator, or sweep drive should be based on the intended application of the oscillator.

The Type 1263-B, 1264-A, 1267-A or 1269-A Power Supply can be readily attached to the Unit Oscillator to form a single unit for bench use or for relay-rack mounting with the listed adaptor plates.

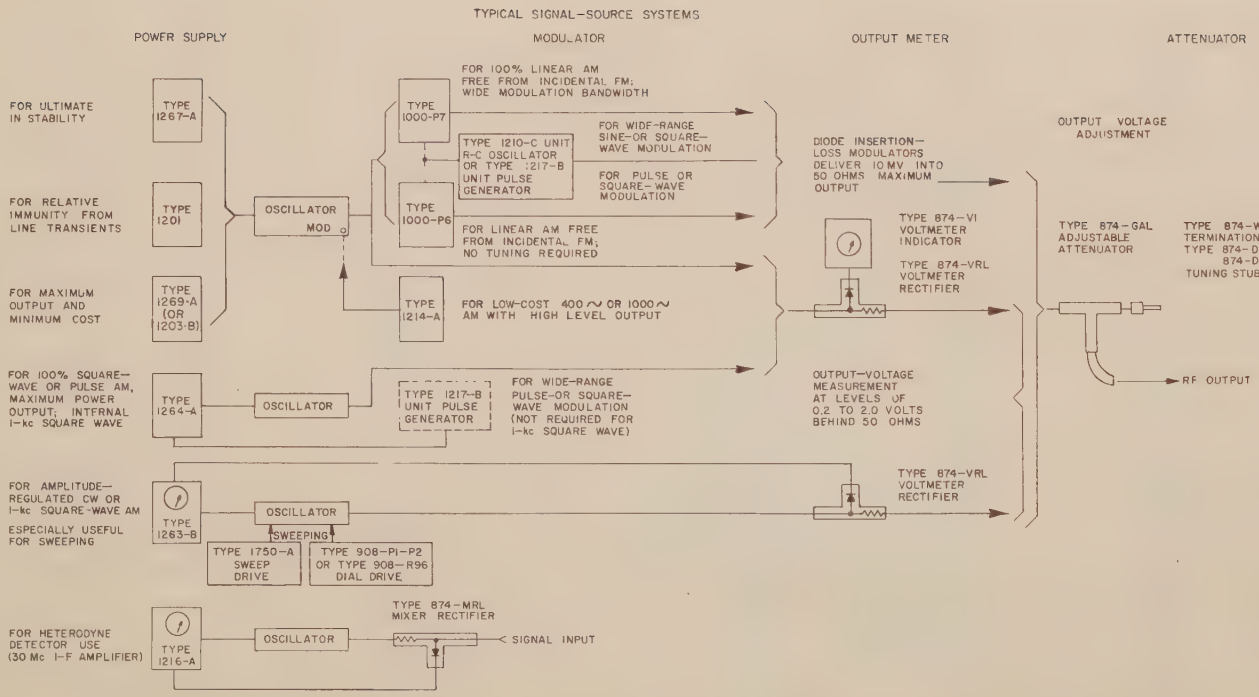


Figure 1-6 Typical signal-source systems built with a Unit Oscillator and associated equipment.

TABLE 1 - ACCESSORIES

Function	Instrument	Remarks
POWER SUPPLIES		
For best stability, freedom from line-voltage variations, and minimum residual fm.	Type 1267-A Power Supply	Regulated dc plate and heater supplies.
For relative immunity from line transients.	Type 1201 Unit Power Supply	Regulated dc plate supply and ac heater supply.
For maximum output at minimum cost.	Type 1269-A (or 1203) Power Supply	Filtered dc plate supply and ac heater supply, both unregulated.
For 100% square-wave or pulse amplitude modulation, and cw operation, and maximum power output.	Type 1264-A Modulating Power Supply	Internal 1-kc square-wave generator. Requires Type 1264-P1 Adaptor Cable.
For amplitude-regulated cw or 1-kc square-wave modulated output.	Type 1263-B Amplitude-Regulating Power Supply	Leveled output of 20 mw into 50 ohms. Requires Type 874-VRL Voltmeter Rectifier.
For use as local oscillator in heterodyne detector system.	Type 1216-A Unit I-F Amplifier	30-Mc center-frequency amplifier has calibrated attenuator and output meter. Use with Type 874-MRL Mixer Rectifier.
MODULATORS		
For pulse and square-wave modulation with little incidental fm.	Type 1263-B Type 1264-A	See listing above.
For sinusoidal plate modulation at 400 and 1000 cps.	Type 1214-A Unit Oscillator	Provides 30% modulation.
Absorption modulation with no incidental fm.	Type 1000-P6 Crystal Diode Modulator	30% modulation; 10 mv peak rf output into 50 ohms. Requires modulation source.
Pulse modulation with excellent carrier suppression. Absorption modulation with no incidental fm.	Type 1000-P7 Balanced Modulator	100% modulation; 10 mv peak rf output into 50 ohms; 20-Mc modulation bandwidth. Requires modulation source.

Table 1 - Accessories (continued)

SWEEP DRIVES	The Type 1263-B Amplitude-Regulating Power Supply is recommended for use with all sweep drives.	
For automatic frequency sweep at 96° per minute	Type 908-P1 Synchronous Dial Drive	Drive fits dial mechanism in place of knob. Adjustable stops that clamp on dial can be used to restrict range swept.
For automatic sweep at 720° per minute	Type 908-P2 Synchronous Dial Drive	
For automatic sweep at 96° per minute and provision for manual setting or drive.	Type 908-R96 Dial Drive	Potentiometer provides output sweep voltage proportional to dial position.
For adjustable sweep arc and speed	Type 1750-A Sweep Drive	Magnitude and center position of sweep arc and the sweep rate are set by panel controls; provides horizontal deflection voltage proportional to shaft angle.
ADAPTOR PLATE SETS		
To rack-mount the oscillator alone	Type 480-P408 Adaptor Plate Set	
To rack-mount the oscillator with a Type 1267-A or 1269-A Power Supply	Type 481-P412 Adaptor Plate Set. Panel knockout provided accommodates special GR874 patch cord supplied, to bring rf output to front panel.	
To rack-mount the oscillator with a Type 1263-B or 1264-A Power Supply	Type 481-P416 Adaptor Plate Set. Panel knockout provided accommodates special GR874 patch cord supplied, to bring rf output to front panel.	
To rack-mount the oscillator with a Type 1201-C or 1203-B Power Supply	Type 480-P4UCS1 Adaptor Plate Set	
COAXIAL ELEMENTS	See table at the rear of this manual.	
To convert from Type 874 to other coaxial systems	Type 874-Q Adaptors	
To reduce standing-wave ratio on transmission lines	Type 874-G Attenuators	
To reduce harmonic content of output from oscillator	Type 874-F Filters	
For use in a heterodyne detector system	Type 874-MR(-MRL) Mixer Rectifier	Particularly useful with Type 1216-A Unit I-F Amplifier.
To provide monitored output level	Type 874-VR(-VRL) Voltmeter Rectifier	Use with Type 874-VI Voltmeter Indicator.

SECTION 2

OPERATING PROCEDURE

2.1 INSTALLATION.

2.1.1 CONNECTION TO POWER SUPPLY. The Unit Oscillator is shipped complete with tube installed, and is ready for use when connected to a suitable power supply. A cord and connector are supplied with the instrument for direct connection to a General Radio power supply. Refer to paragraph 1.5 for power-supply recommendations.

To connect the oscillator to the power supply, plug the oscillator power cable into the receptacle on the side of the power supply. Connection to the front panel MOD jack is also required when either the Type 1264-A Modulating Power Supply (by way of the accessory adaptor cable, Type 1264-P1) or the Type 1263-B Amplitude-Regulating Power Supply (by way of the patch cord supplied with the Type 1263-B) is used.

2.1.2 BENCH MOUNTING. The Type 1263-B, 1264-A, 1267-A, or 1269-A Power Supply can be rigidly attached to the oscillator by means of the narrow adaptor plate and associated screws supplied with the power supply and the clip which is attached to the oscillator L bracket with the mounting screw for the left front foot. To attach the units, proceed as follows:

a. Temporarily remove the upper and lower right-hand corner panel screws from the front panel of the power supply. Place the adaptor plate supplied with the power supply in position, and replace the screws.

b. Remove the front and rear left feet from the oscillator, and install the clip freed from the front-foot mounting screw on the top surface of the oscillator L bracket in the left rear foot mounting location. Note that the L bracket hole in this location is tapped 10-32 to secure the mounting screw. Do not replace the feet.

c. Attach the oscillator to the power supply by fastening the upper and lower right-hand corners of the adaptor plate to the corresponding tapped holes in the upper and lower left-hand corners of the oscillator panel. Attach the clip at the left-hand rear of the oscillator to the matching hole in the right-hand side of the power supply. The necessary screws and nut are supplied with the power supply.

2.1.3 RELAY-RACK MOUNTING. To rack-mount the oscillator by itself, a Type 480-P408 Adaptor Plate Set is required. To rack-mount the oscillator attached to a Type 1267-A or 1269-A Power Supply, a Type 481-P412 Adaptor Plate Set is required. To rack-mount the oscillator attached to a Type 1263-B or 1264-A Power Supply, a Type 481-P416 Adaptor Plate Set is required. After attaching the power supply to the left-hand side of the oscillator as described in paragraph 2.1.2, one adaptor plate is installed

on the left-hand side of the combined unit, and the other on the right-hand side. The screws required are supplied with the Adaptor Plate Sets.

2.1.4 MODULATOR CONNECTION. For sinusoidal amplitude modulation the audio modulating voltage should be inserted at the MOD jack on the front panel. Full plate current must flow through the modulating source. A modulation voltage of about 40 volts is required for 30-percent modulation. The input impedance is about 8000 ohms. The Type 1214-A Unit Oscillator is an economic 400- and 1000-cycle modulator for the Unit Oscillator.

2.1.5 RF OUTPUT CONNECTIONS. With the Type 1201, 1264-A, 1267-A or 1269-A Power Supply, the oscillator rf output may be connected directly to the equipment under test by means of the three-foot coaxial cable supplied.

Attenuator pads may help to reduce standing waves on the cable where the equipment under test does not provide a good termination. Without padding, cable resonance effects may be quite pronounced since the output coupling loop of the oscillator is not a matched source. A low-pass filter may be beneficial in cases where oscillator harmonics must be kept to very low values.

When the Type 1263-B Amplitude-Regulating Power Supply is used, the oscillator rf output should be connected directly to the short cross arm of a Type 874-VRL Voltmeter Rectifier. The longer cross arm output labeled "R" contains a 50-ohm series resistor which is the effective generator source impedance. The leveled rf output available at the "R" connector may now be connected to the equipment under test. The rectified output available from the stem of the rectifier should be connected to the front panel connector of the Type 1263-B labeled "OUTPUT RECTIFIER" by means of a Type 874-R22A Patch Cord.

If cables equipped with military connectors are to be used, a suitable adaptor may be semipermanently attached to the locking Type 874 output receptacle of the oscillator. See the table at the rear of this book for a listing of available adaptors.

2.2 OPERATION.

After turning on the power supply and setting the frequency dial to the desired operating frequency, adjust the output coupling loop to produce the desired output. If adequate padding (refer to paragraph 2.1.5) is used, a loop setting that is satisfactory at the high-frequency end of the tuning range will generally be suitable over the entire range. To obtain a satisfactory loop setting, first orient the loop plane vertically with the grounded side downward. Insert the loop only far enough to produce a maximum output. Full insertion or 180° rotation of the loop will not permit smooth output over the entire tuning range.

If the load does not provide a good termination for the oscillator, it may be necessary to reposition the loop with changes in operating frequency. In such cases, leave the loop in the rearmost position that will provide the desired output.

SECTION 3

APPLICATIONS

3.1 GENERAL.

The utility and versatility of the Types 1209-C and 1209-CL Unit Oscillators are greatly increased by the large selection of Type 874 coaxial elements, available from General Radio Company. These elements are part of a complete, integrated line of equipment for the measurement of voltage, power, and standing-wave ratio at very-high and ultra-high frequencies. Although the Unit Oscillator is intended primarily as a source of power for this measuring equipment and for other impedance-measuring devices such as the Type 1602-B UHF Admittance Meter, use of the coaxial elements can adapt the Unit Oscillator to various applications in the radio-frequency laboratory in place of more expensive equipment that is not always available. The tuning circuits of the Type 1209-CL and Type 1209-C Unit Oscillators use ball bearings, and thus can be motor-driven, for sweep applications, by sweep and dial drives (refer to paragraphs 1.4 and 1.5).

Applications are described in detail in the following paragraphs. Others will be suggested by a study of the complete list of Type 874 Coaxial elements, included in the General Radio Catalog. Coaxial elements with either locking or nonlocking connectors can be used. A condensed list of Type 874 elements appears in the rear of this manual.

3.2 UNIT OSCILLATOR AS SIGNAL GENERATOR FOR RECEIVER TESTING.

The Unit Oscillator, as a well-shielded power source, can be used as a signal generator to test receivers if means are available to measure and attenuate the output. The Type 874-VR Voltmeter Rectifier, Type 874-VI Voltmeter Indicator, and Type 874-GAL Adjustable Attenuator are suitable for this purpose, and should be connected to the Unit Oscillator as shown in Figure 3-1. Also, a Type 874-D50L Adjustable Stub is required to produce a current maximum at that point of the attenuator where the adjustable output loop is coupled. A tuning element between the oscillator and the attenuator is required to increase the output to a value that can be read on the voltmeter. At higher frequencies coverage is obtained by a Type 874-LAL Adjustable Line. At lower frequencies additional lengths of line must be used.

Current from the Unit Oscillator is fed through the attenuator into the short circuit at the stub. The attenuator is calibrated in decibels. At minimum attenuation the attenuator output is measured by a crystal diode in the voltmeter rectifier and read on the meter of the voltmeter indicator. Means are provided to standardize the crystal indication. A 50-ohm resistor after the crystal determines the output impedance.

With the above-described arrangement, the maximum available output is several tenths of a volt. The attenuator calibration covers 120 db, but shielding of the Unit Oscillator and of other components is not sufficient for accurate measurements in the microvolt region.

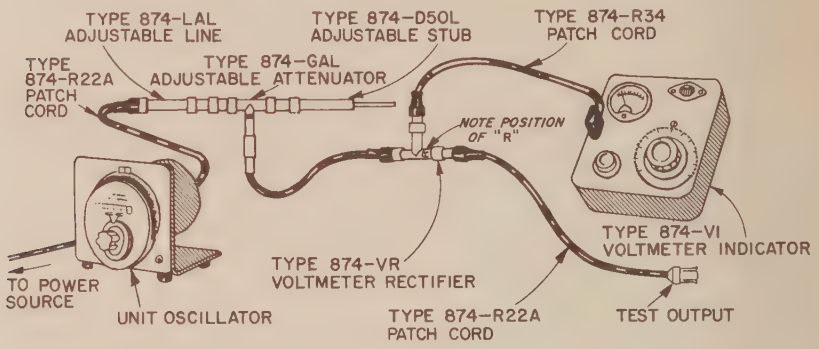


Figure 3-1. Setup of a Unit Oscillator and accessories for use as a standard-signal generator.

3.3 UNIT OSCILLATOR AS A TELEVISION SIGNAL GENERATOR.

Used in combination with a Type 1000-P6 Crystal Diode Modulator and a Type 874-G20 20-db Fixed Attenuator, the Unit Oscillator is a convenient source of television signals over its entire carrier-frequency range if video modulating voltage is available. (See Figure 3-2.) The modulating voltage required can be obtained from a standard television receiver tuned to the local channel.

Since the modulator and oscillator are separated from each other by an attenuator pad, amplitude modulation is free from incidental fm. Output is about 10 millivolts.

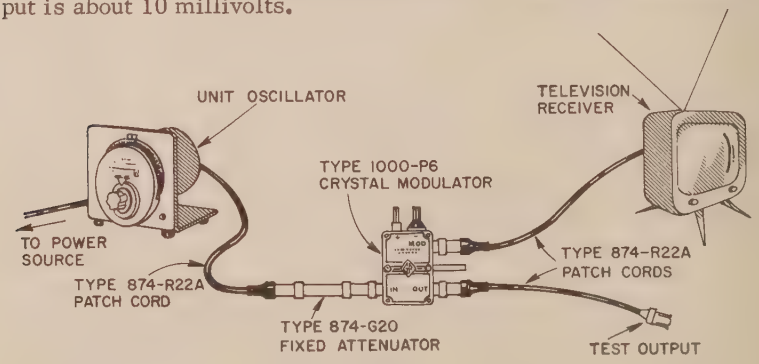


Figure 3-2. Setup of a Unit Oscillator with a video modulator for use as a television-signal generator.

3.4 UNIT OSCILLATOR AS A FREQUENCY CONVERTER.

Connected to a Type 874-MRL Mixer Rectifier, the Unit Oscillator can provide the local signal in a heterodyne converter to adapt the Type 1216-A Unit I-F Amplifier for use as a sensitive detector for vhf and uhf signals. (See Figure 3-3.) Without additional tuning, the conversion loss is about 6 db at an intermediate frequency of 30 Mc. The Type 1216-A I-F Amplifier has a built-in precision attenuator and a panel meter. Its bandwidth is 0.7 Mc and it has excellent sensitivity. Provision is made for the measurement of the rectified mixer current in the I-F amplifier, and a separate built-in power supply is available for operating the Unit Oscillator.

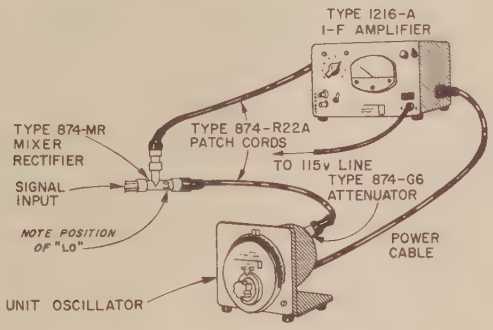


Figure 3-3 Setup of a Unit Oscillator and Mixer rectifier for use as a frequency converter.

3.5 UNIT OSCILLATOR AS A TRANSFER OSCILLATOR.

The oscillator can be used as a transfer oscillator to measure the frequency of a microwave source, or as a heterodyne frequency meter of limited accuracy.

Auxiliary equipment required, in addition to a power supply, includes a Type 1232-A Amplifier, a Type 874-VRL Voltmeter Rectifier, a Type 874-G10L pad, a Type 874-R22A patch cord, and two patch cords such as a Type 874-R22LA for connection to the signal source and frequency-measuring equipment. The necessary connections are shown in Figure 3-4.

The oscillator should be tuned to zero beat with the source at two or more points on the dial. Note the frequencies of a pair of successive, strong beats. The harmonic order can then be determined as follows:

Let: f_s = the source frequency

f_h = the higher frequency of two successive, strong beats

f_ℓ = the lower frequency of two successive, strong beats

$f_d = f_h - f_\ell$ = the difference between these two frequencies

$H = \frac{f_h}{f_d}$ (always an integer)

and the signal frequency, f_s, is:

$$f_s = Hf_\ell = (H-1)f_h$$

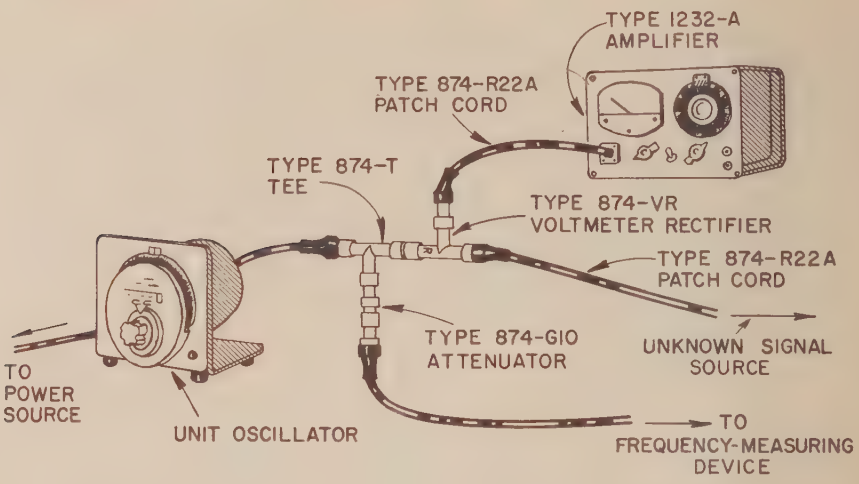


Figure 3-4 Setup of a Unit Oscillator and accessories for frequency measurement.

For greatly improved accuracy, f_l or f_h may be measured while beating with the unknown. The Type 1130-A Digital Time and Frequency Meter with the Type 1133-A Frequency Converter can be used to measure frequencies up to 500 Mc with high accuracy, or a precision heterodyne frequency meter may be used.

Similar oscillators for other tuning ranges in the vhf-uhf region are as follows:

50-250 Mc- Type 1215	450-1050 Mc- Type 1361
65-500 Mc- Type 1208	900-2000 Mc- Type 1218

SECTION 4

SERVICE AND MAINTENANCE

4.1 GENERAL.

We warrant that each new instrument sold by us is free from defects in material and workmanship, and that, properly used, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, district office, or authorized repair agency personnel, will be re-

paired, or, at our option, replaced without charge, except for tubes or batteries that have given normal service.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be eliminated by use of the following service instructions, please write or phone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest district office, requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

4.2 TUBE REPLACEMENT.

When it is necessary to replace the Type 6481 oscillator tube, install the new tube as follows (see Figure 4-1):

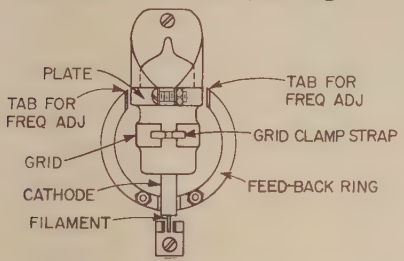


Figure 4-1 Installation detail of oscillator tube.

a. Remove the screw holding the plate clamp.

b. Loosen the grid clamp strap until the tube can be slid into position. Place the cathode connection just short of the filament clip.

c. Carefully tighten the grid clamp by bending the ends of the strap

d. Replace the plate screw and carefully tighten the plate clamp.

CAUTION

Be careful when tightening clamps. Glass seals are fragile.

e. Restore frequency calibration, if necessary, in accordance with paragraph 4.3.

4.3 FREQUENCY CALIBRATION.

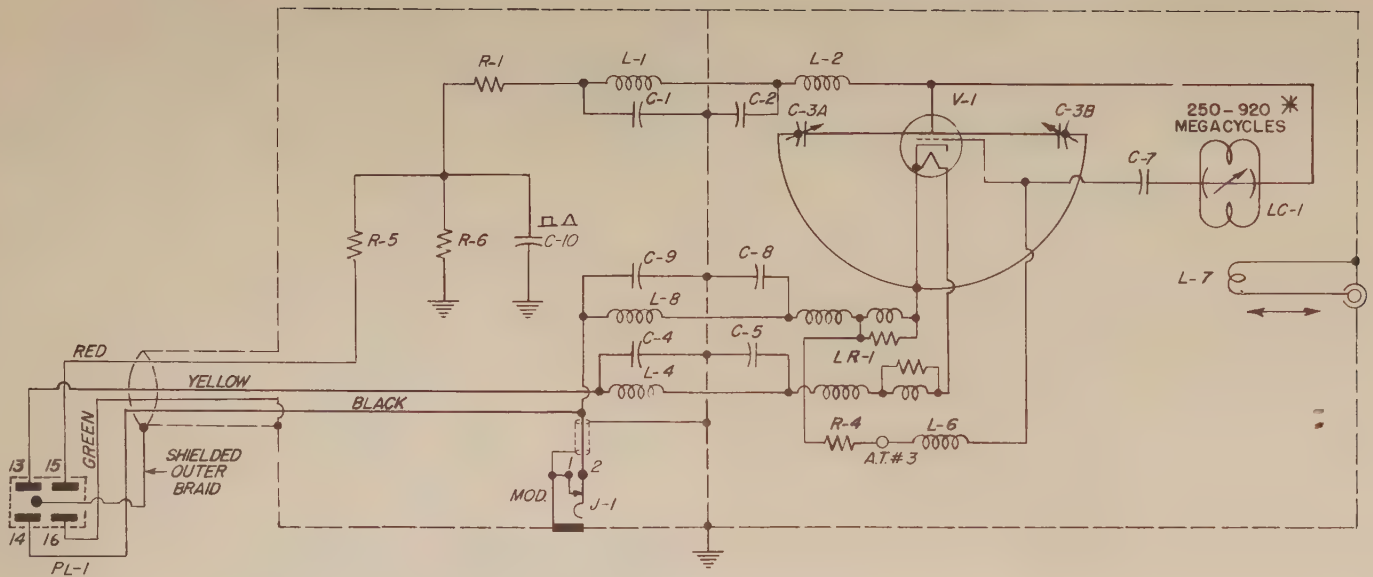
Replacement of the oscillator tube may affect frequency calibration. It can be restored by adjustment of one of the flexible tabs on the feedback ring. Before adjusting this trimmer capacitor, allow the instrument to warm up, since warmup drift may be as much as 0.2 percent. This adjustment should be made at the high-frequency end of the oscillator tuning range. It is also important to note that the oscillator shield affects frequency considerably, especially at the low-frequency end.

4.4 LUBRICATION.

When the Type 1209 Unit Oscillator is driven by a sweep or dial drive, all moving parts must be properly lubricated. Proper lubrication includes an occasional drop of light oil at the ball bearings, and occasional relubrication of the pinion gear in the dial assembly.

PARTS LIST

REF NO.	DESCRIPTION	PART NO.
R1	RESISTOR, Wire-wound 560Ω ±10%	6760-1569
R4	RESISTOR, Composition 1kΩ ±5%	6100-2105
R5	RESISTOR, Power 4.7k4 ±5%	6640-2475
R6	RESISTORS, Composition (two in parallel) 43kΩ ±5%	6120-3435
C1	CAPACITOR, Fixed Mica 200pf ±10%	4920-1900
C2	CAPACITOR, Fixed Mica 200pf ±10%	4920-0400
C4	CAPACITOR, Fixed Mica 500pf ±10%	4920-2000
C5	CAPACITOR, Fixed Mica 500pf ±10%	4920-0600
C8	CAPACITOR, Fixed Mica 500pf ±10%	4920-0600
C9	CAPACITOR, Fixed Mica 500pf ±10%	4920-2000
C10	CAPACITOR, Electrolytic 20μf 450v	4450-0300
J1	SHIELDED CABLE SET	8161-3285
L1	CHOKE, Air 45μh	4290-0600
L2	CHOKE, Air 45μh	4290-0600
L4	CHOKE, Air 20μh	4290-1000
L6	CHOKE, Air 45μh	4290-0600
L7	COUPLING LOOP	0874-4012
L8	CHOKE, Air 20μh	4290-1000
LR1	HEATER FILTER ASSEMBLY	1021-2160
PL1	PLUG	1209-0300
V1	TUBE, Type 6481	8380-6481



* Type 1209-CL: 180-600 Mc

Figure 4-2 Schematic diagram for the Types 1209-C and 1209-CL Unit Oscillators.

TYPE 874 COAXIAL COMPONENTS

TYPE 874 CABLE CONNECTORS

APPLICABLE CABLE TYPES	CONNECTOR TYPE	CABLE	CABLE LOCKING	PANEL FLANGED	PANEL LOCKING	PANEL LOCKING RECESSED
	874-A2	-CA	-CLA	-PBA	-PLA	-PRLA
50-OHM	RG-8A/U RG-9B/U RG-10A/U RG-87A/U RG-116/U RG-156/U RG-165/U RG-166/U RG-213/U RG-214/U RG-215/U RG-225/U RG-227/U	-C8A	-CL8A	-PB8A	-PL8A	-PRL8A
NON-50-OHM	RG-11A/U RG-12A/U RG-13A/U RG-63B/U RG-79B/U RG-89/U RG-144/U RG-146/U RG-149/U RG-216/U					
50-OHM	874-A3 RG-29/U RG-55/U (Series) RG-58/U (Series) RG-141A/U RG-142A/U RG-159/U RG-223/U	-C58A	-CL58A	-PB58A	-PL58A	-PRL58A
MEDIUM-50-OHM	RG-59/U RG-62/U (Series) RG-71B/U RG-140/U RG-210/U	-C62A	-CL62A	-PB62A	-PL62A	-PRL62A
50-OHM	RG-174/U RG-188/U RG-316/U	-C174A	-CL174A	-PB174A	-PL174A	-PRL174A
NON 50-OHM	RG-161/U RG-187/U RG-179/U					

Example: For a locking cable connector for RG-8A/U, order Type 874-CL8A.

TYPE 874 ADAPTORS

TO TYPE		874-
BNC	plug	QBJA
		QBJL*
	jack	QBPA
C	plug	QCJA
		QCJL*
	jack	QCP
HN	plug	QHJA
	jack	QHPA
LC	plug	QLJA
		QLPA
LT	plug	QLTJ
	jack	QLTP
Microdot	plug	QMDJ
		QMDJL*
	jack	QMDP
N	plug	QNJA
		QNJL*
	jack	QNP
SC (Sandia)	plug	QSCJ
		QSCJL*
	jack	QSCP
TNC	plug	QTNJ
		QTNJL*
	jack	QTNP
UHF	plug	QUJ
		QUJL*
	jack	QUP
UHF	7/8-in.	QU1A
50-Ω	1-5/8-in.	QU2
Air Line	3-1/8-in.	QU3A

*Locking Type 874 Connector.

Example: To connect Type 874 to a Type N jack, order Type 874-QNP.

CONNECTOR ASSEMBLY TOOLS

TYPE 874-	FUNCTION
TOK	Tool Kit
TO58	Crimping Tool
TO8	Crimping Tool

OTHER COAXIAL ELEMENTS

TYPE 874-		TYPE 874-	
A2	50 Ω cable (low loss)	LR	radiating line
A3	50 Ω cable	LTL	trombone constant-Z line
D20L, D50L	20-, 50-cm adjustable stubs	ML	component mount
EL, EL-L	90° ell	MB	coupling probe
F185L	185-Mc low-pass filter	MR, MRL	mixer-rectifier
F500L	500-Mc low-pass filter	R20A, R20LA	patch cord, double coax
F1000L	1000-Mc low-pass filter	R22A, R22LA	patch cord, double coax
F2000L	2000-Mc low-pass filter	R33	patch cord, single coax
F4000L	4000-Mc low-pass filter	R34	patch cord, single coax
G3, G3L		T, TL	tee
G6, G6L	3-, 6-, 10-, & 20-db attenuators	UBL	balun
G10, G10L		VCL	variable capacitor
G20, G20L		VI	voltmeter indicator
GAL	adjustable attenuator	VQ, VQL	voltmeter detector
H500L	isolator	VR, VRL	voltmeter rectifier
H1000L	isolator	W100	100-Ω termination
H2000L	isolator	W200	200-Ω termination
JR	rotary joint	W50, W50L	50-Ω termination
K, KL	coupling capacitor	WN, WN3	short-circuit terminations
L10, L10L	10-, 20-, & 30-cm rigid air lines	WO, WO3	open-circuit terminations
L20, L20L		X	insertion unit
L30, L30L		XL	series inductor
LAL	33-58 cm adjustable line	Y	cliplock
LK10L, LK20L	constant-Z adjustable lines	Z	stand

MISCELLANEOUS COAXIAL CONNECTORS

CONNECTOR TYPE	TYPE NO.	USED WITH
Basic	874-B	50-ohm Air Line
Basic Locking	874-BL	50-ohm Air Line
Panel Locking	874-PLT	Wire Lead
Panel Locking Recessed	874-PRLT	Wire Lead
Panel Locking Feedthrough	874-PFL	Type 874 Patch Cords

L suffix indicates locking Type 874 Connector.

ACCESSORY EQUIPMENT

TYPE 1267-A REGULATED POWER SUPPLY

Regulated heater and plate supplies provide freedom from line-voltage variations and minimum residual fm. Attaches readily to Type 1361-A Oscillator.

Two models available:
Type 1267-A (for 115-v operation).
Type 1267-AQ18 (for 230-v operation).

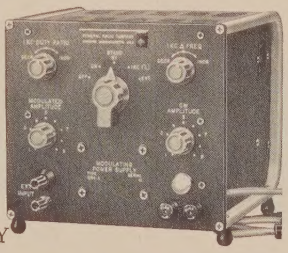
TYPE 1269-A POWER SUPPLY

A general-purpose power supply with filtered dc plate supply and ac heater supply (both unregulated). Attaches readily to Type 1361-A Oscillator. Can be operated from 115-v or 230-v supply.

TYPE 1201-B UNIT REGULATED POWER SUPPLY

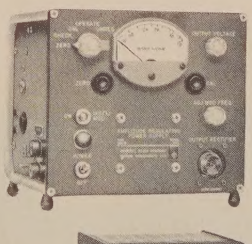
Ac heater supply and regulated dc plate supply which minimizes effects of line-voltage variations.

Two models available:
Type 1201-B (for 115-v operation).
Type 1201-BQ18 (for 230-v operation).



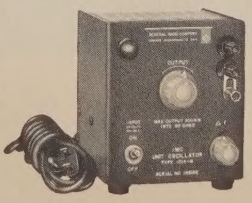
TYPE 1264-A MODULATING POWER SUPPLY

Provides 100% pulse and square-wave modulation and can also be used as a source of adjustable, well-regulated, plate power and unregulated heater power. Attaches readily to the Type 1361-A Oscillator. Can be operated from 115-v or 230-v supply.



TYPE 1263-B AMPLITUDE-REGULATING POWER SUPPLY

For amplitude-regulating cw or 1-kc square-wave modulated output. Maintains oscillator output at a preset value in spite of frequency, load, and line-voltage variations. Particularly useful when the oscillator is mechanically driven. Attaches readily to the Type 1361-A Oscillator. Can be operated from 115-v or 230-v supply.

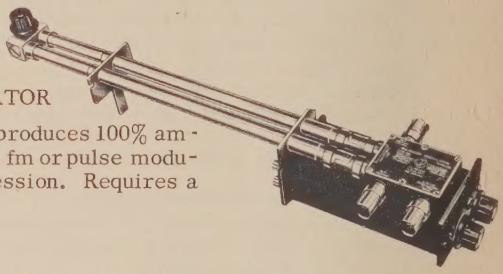


TYPE 1214-A UNIT OSCILLATOR

This compact and inexpensive Unit oscillator can be used to provide sinusoidal plate modulation at 400 and 1000 cps. Operates from 115-v supply.

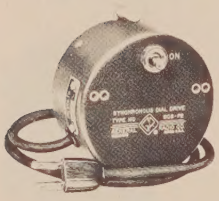
TYPE 1000-P6 CRYSTAL DIODE MODULATOR

This insertion-loss modulator produces fm-free 30% amplitude modulation. Requires a modulation source.



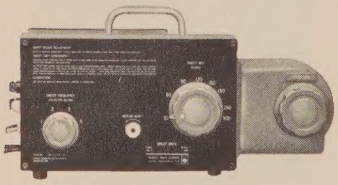
TYPE 1000-P7 BALANCED MODULATOR

This insertion-loss modulator produces 100% amplitude modulation with no incidental fm or pulse modulation with excellent carrier suppression. Requires a modulation source.



TYPE 908 DIAL DRIVES

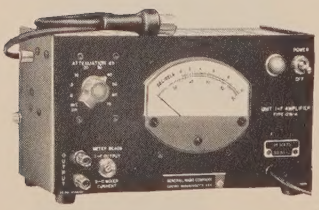
These drives install directly in place of the knob on the oscillator dial for automatic frequency sweep. Stops are adjustable and the drives reverse automatically. The Type 908-P1 sweeps the Type 1361-A at 96° per minute and is recommended for use with an graphic recorder: the Type 908-P2 sweeps at 720° per minute and is recommended for oscilloscopic displays; the Type 908-R96, which has provision for manual setting or drive and provides a sweep voltage proportional to the angle of rotation, sweeps at 96° per minute and is recommended for use with an XY recorder.



TYPE 1750-A SWEEP DRIVE

This drive attaches to the knob on the oscillator dial for automatic frequency sweep. It provides a horizontal deflection voltage proportional to shaft angle. It offers an adjustable sweep arc, adjustable center position of the arc, and adjustable sweep speed. A blanking circuit eliminates the oscilloscope return trace and produces a base line.

Two models available:
Type 1750-A (for 115-v operation).
Type 1750-AQ18 (for 230-v operation).



TYPE 1216-A UNIT I-F AMPLIFIER

In a heterodyne system, this 30-Mc Center-frequency amplifier, which includes a calibrated attenuator and output meter, can be used with the Type 874-MRL Mixer Rectifier as the detector. The amplifier also supplies plate and heater power to the heterodyning Type 1361-A Oscillator. Can be operated from 115-v or 230-v supply.

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS,* 01781

617 369-4400 617 646-7400

SALES ENGINEERING OFFICES

METROPOLITAN NEW YORK*

Broad Avenue at Linden
Ridgefield, New Jersey, 07657
Telephone N.Y. 212 964-2722
N.J. 201 943-3140

SYRACUSE

Pickard Building
East Molloy Road
Syracuse, New York, 13211
Telephone 315 454-9323

PHILADELPHIA

General Radio Company
Fort Washington Industrial Park
Fort Washington, Pennsylvania 19034
Telephone 215 646-8030

WASHINGTON* AND BALTIMORE

Rockville Pike at Wall Lane
Rockville, Maryland, 20852
Telephone 301 946-1600

ORLANDO

113 East Colonial Drive
Orlando, Florida, 32801
Telephone 305 425-4671

* Repair services are available at these district offices.

CHICAGO*

6605 West North Avenue
Oak Park, Illinois, 60302
Telephone 312 848-9400

CLEVELAND

5579 Pearl Road
Cleveland, Ohio, 44129
Telephone 216 886-0150

LOS ANGELES*

1000 North Seward Street
Los Angeles, California, 90038
Telephone 213 469-6201

SAN FRANCISCO

1186 Los Altos Avenue
Los Altos, California, 94022
Telephone 415 948-8233

DALLAS

2501-A West Mockingbird Lane
Dallas, Texas, 75235
Telephone 214 FLeetwood 7-4031

TORONTO*

99 Floral Parkway
Toronto 15, Ontario, Canada
Telephone 416 247-2171

MONTREAL

Office 395, 1255 Laird Boulevard
Town of Mount Royal, Quebec, Canada
Telephone 514 737-3673

General Radio Company (Overseas), 8008 Zurich, Switzerland
General Radio Company (U.K.) Limited, Bourne End, Buckinghamshire, England
Representatives in Principal Overseas Countries

Printed in USA